WE CLAIM:

1. Apparatus for processing data, said apparatus comprising:

a data processing circuit operable to execute program instructions to perform data processing operations during an operational mode, said data processing circuit being dynamically switchable between said operational mode and a powered down mode; and

a diagnostic circuit operable to perform diagnostic operations upon said data processing circuit;

wherein when said data processing circuit returns to said operational mode from said powered down mode and any required processing operations have been completed, said diagnostic circuit prevents execution of further program instructions until released by said diagnostic circuit.

2. Apparatus as claimed in claim 1, wherein when said data processing circuit returns to said operational mode from said powered down mode and any required processing operations have been completed and execution of further program instruction has been prevented, said diagnostic circuit forces diagnostic processing to be commenced.

3. Apparatus as claimed in claim 2, wherein when executing within a mode in which diagnostic processing is not permitted, said diagnostic circuit forces diagnostic processing to be commenced at a next permitted point.

4. Apparatus as claimed in claim 3, wherein said mode does not permit program execution to be halted.

5. Apparatus as claimed in claim 1, wherein upon return to said operational mode from said powered down mode by said data processing circuit said diagnostic circuit holds said data processing circuit in a reset condition until a subsequent diagnostic operation releases said reset condition.

6. Apparatus as claimed in claim 5, wherein said diagnostic circuit responsive to a diagnostic operation to force diagnostic processing when said reset condition is released.

5   7. Apparatus as claimed in claim 6, wherein said forcing of diagnostic processing includes halting program instruction execution.

8. Apparatus as claimed in claim 1, wherein

upon return to said operational mode from said powered down mode by said
10   data processing circuit said data processing circuit is operable to prevent access by said diagnostic circuit to one or more registers within said data processing circuit until after a restore operation restoring data values to said registers; and

said diagnostic circuit is responsive to completion of said restore operation to force diagnostic processing to be commenced.

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9. Apparatus as claimed in claim 1, wherein whilst execution is prevented, said diagnostic circuit is responsive to one or more diagnostic operation commands to setup a diagnostic circuit configuration to investigate return of said data processing circuit to said operational mode when released by said diagnostic circuit.

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10. Apparatus as claimed in claim 1, wherein said diagnostic circuit is responsive to a diagnostic operation signal to program said diagnostic circuit to prevent execution of further program instructions until released by said diagnostic circuit upon a next return to said operational mode from said powered down mode by said data
25   processing circuit.

11. Apparatus as claimed in claim 1, wherein said diagnostic circuit is also operable to prevent said data processing circuit executing predetermined program instructions until released by said diagnostic circuit upon release of a reset condition
30   occurring whilst said data processing circuit remains in said operational mode.

12. A method of processing data, said method comprising the steps of:

executing program instructions with a data processing circuit to perform data processing operations during an operational mode, said data processing circuit being dynamically switchable between said operational mode and a powered down mode; and

5 performing diagnostic operations upon said data processing circuit with a diagnostic circuit;

wherein when said data processing circuit returns to said operational mode from said powered down mode and any required processing operations have been completed, said diagnostic circuit prevents execution of further program instructions

10 until released by said diagnostic circuit.

13. A method as claimed in claim 12, wherein when said data processing circuit returns to said operational mode from said powered down mode and any required processing operations have been completed and execution of further program

15 instructions has been prevented, said diagnostic circuit forces diagnostic processing to be commenced.

14. A method as claimed in claim 13, wherein when executing within a mode in which diagnostic processing is not permitted, said diagnostic circuit forces diagnostic

20 processing to be commenced at a next permitted point.

15. Apparatus as claimed in claim 14, wherein said mode does not permit program execution to be halted.

25 16. A method as claimed in claim 12, wherein upon return to said operational mode from said powered down mode by said data processing circuit said diagnostic circuit holds said data processing circuit in a reset condition until a subsequent diagnostic operation releases said reset condition.

30 17. A method as claimed in claim 16, wherein said diagnostic circuit responsive to a diagnostic operation to force diagnostic processing when said reset condition is released.

18.   A method as claimed in claim 17, wherein said forcing of diagnostic processing includes halting program instruction execution.

19.   A method as claimed in claim 12, wherein

upon return to said operational mode from said powered down mode by said data processing circuit said data processing circuit is operable to prevent access by said diagnostic circuit to one or more registers within said data processing circuit until after a restore operation restoring data values to said registers; and

said diagnostic circuit is responsive to completion of said restore operation to force diagnostic processing to be commenced.

20.   A method as claimed in claim 12, wherein whilst execution is prevented, said diagnostic circuit is responsive to one or more diagnostic operation commands to setup a diagnostic circuit configuration to investigate return of said data processing circuit to said operational mode when released by said diagnostic circuit.

21.   A method as claimed in claim 12, wherein said diagnostic circuit is responsive to a diagnostic operation signal to program said diagnostic circuit to prevent execution of further program instructions until released by said diagnostic circuit upon a next return to said operational mode from said powered down mode by said data processing circuit.

22.   A method as claimed in claim 12, wherein said diagnostic circuit is also operable to prevent said data processing circuit executing predetermined program instructions until released by said diagnostic circuit upon release of a reset condition occurring whilst said data processing circuit remains in said operational mode.